Title: NAME RESOLUTION SERVER AND PACKET TRANSFER DEVICE
Inventor(s): Norihito FUJITA, et al.
DOCKET NO.: 040405-0367

FIG. 1

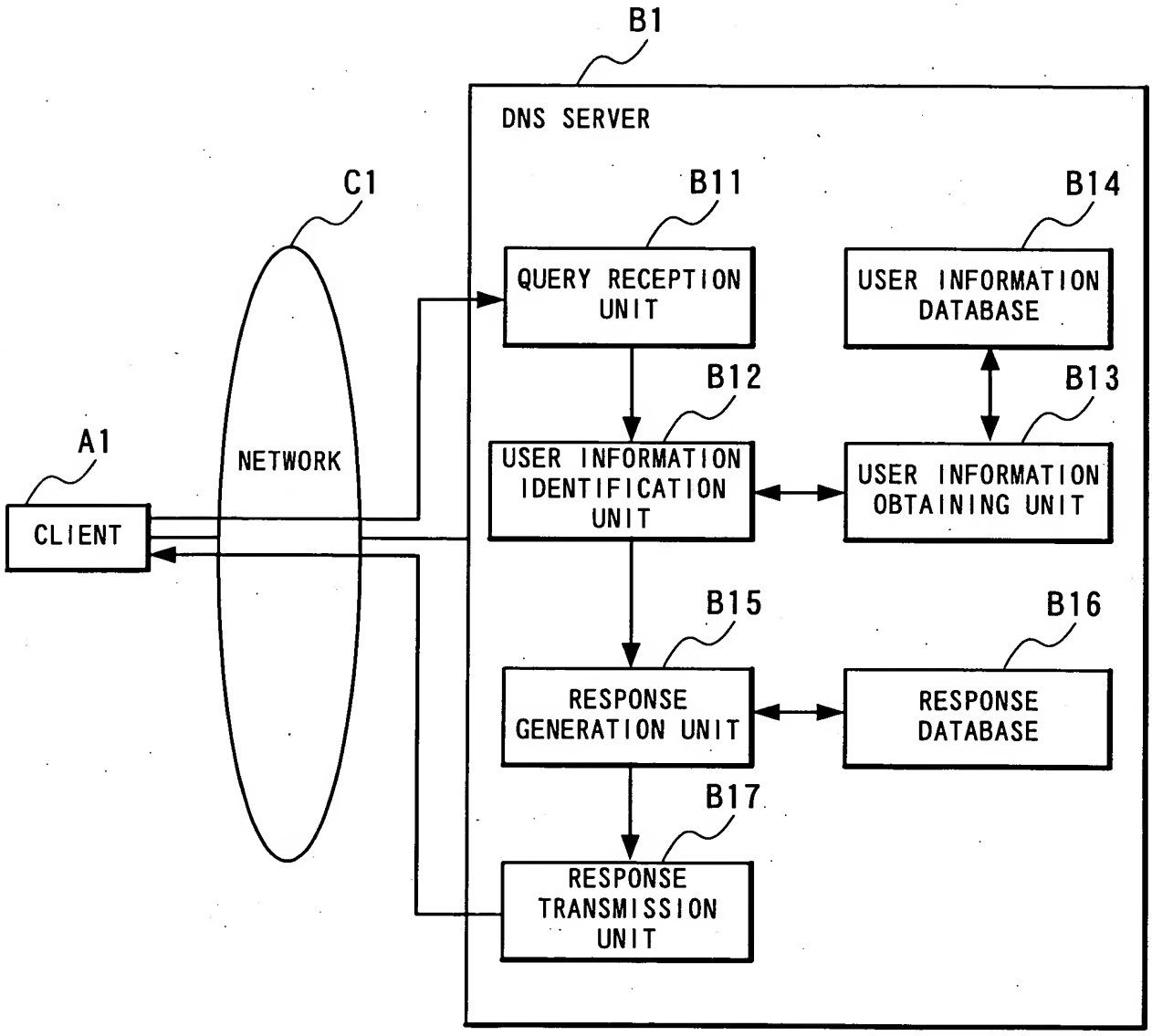


FIG. 2

B14

USER IP ADDRESS	LOG-IN ID	KIND OF CONNECTION LINE	NAS ADDRESS	REFERENCE DESTINATION
123.45.0.2	taro	ADSL	30.30.30.30	—
123.45.0.4	hanako	—	20.20.20.20	8.9.1.4
123.45.1.0/24	—	—	—	9.9.9.9
. . .	. . .	. . .	. . .	. . .

Title: NAME RESOLUTION SERVER AND PACKET TRANSFER DEVICE
Inventor(s): Norihito FUJITA, et al.
DOCKET NO.: 040405-0367

FIG. 3

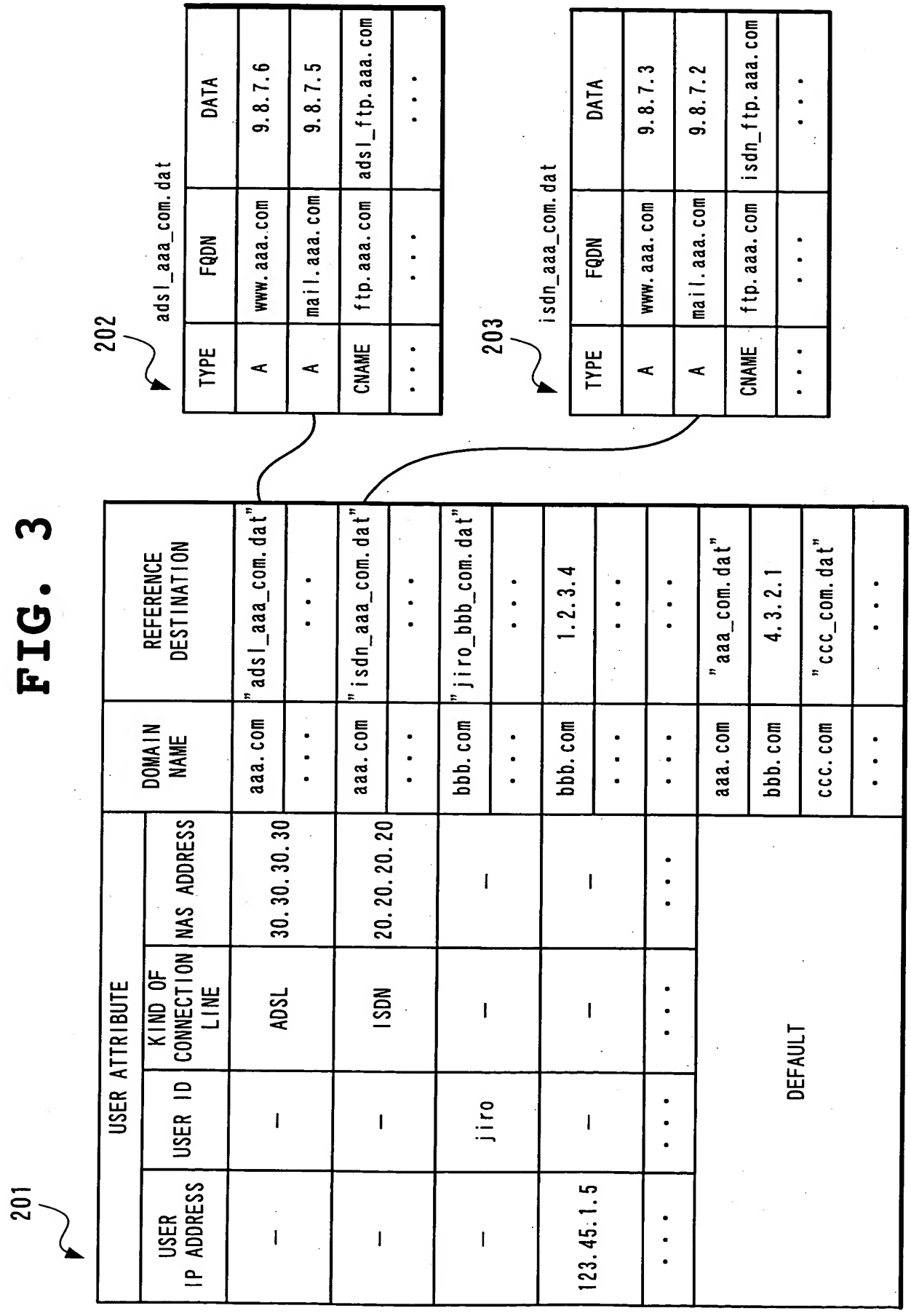


FIG. 4

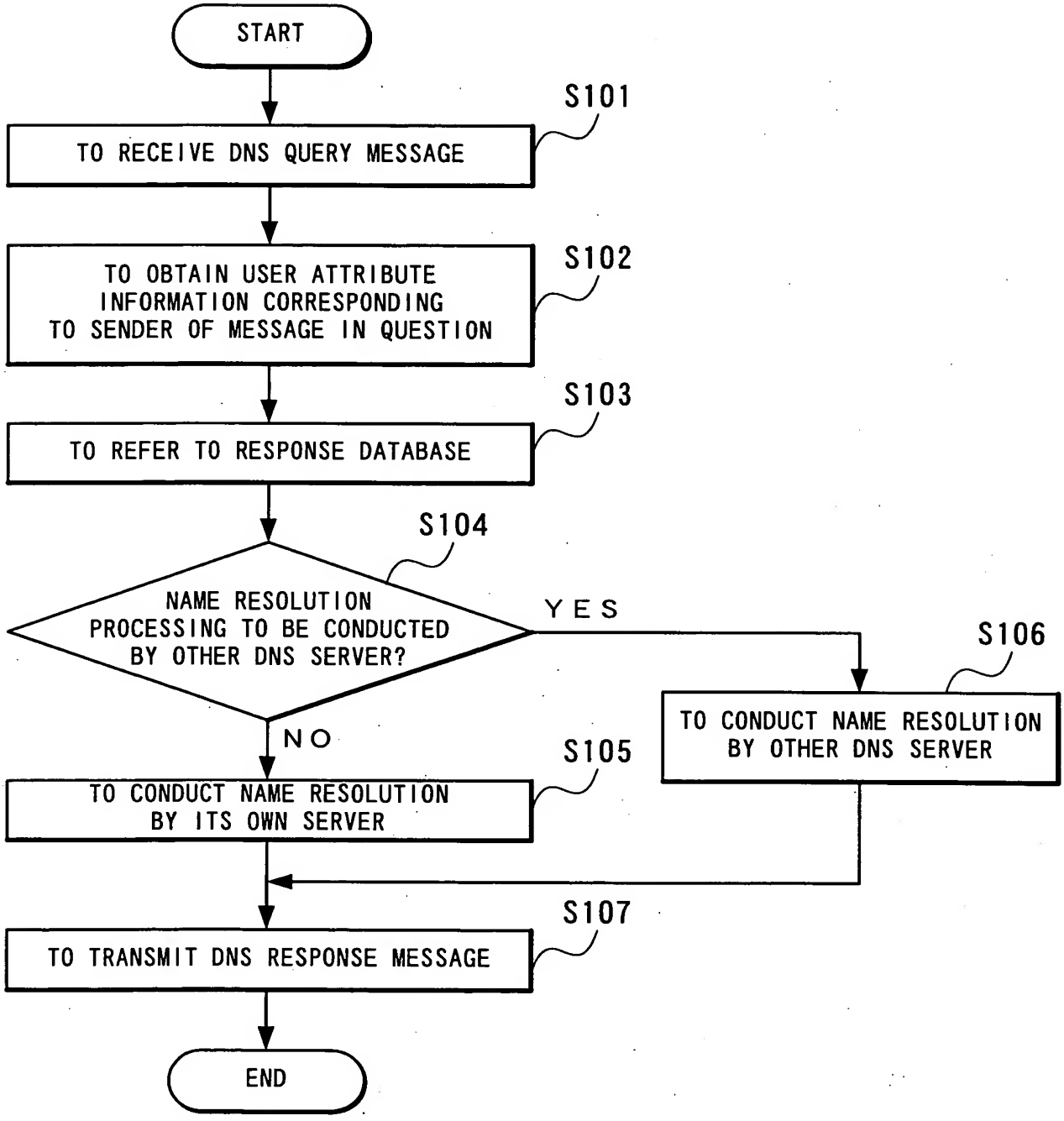

START
S101
TO RECEIVE DNS QUERY MESSAGE
S102
TO OBTAIN USER ATTRIBUTE INFORMATION CORRESPONDING TO SENDER OF MESSAGE IN QUESTION
S103
TO REFER TO RESPONSE DATABASE
S104
NAME RESOLUTION PROCESSING TO BE CONDUCTED BY OTHER DNS SERVER?
YES
NO
S106
TO CONDUCT NAME RESOLUTION BY OTHER DNS SERVER
S105
TO CONDUCT NAME RESOLUTION BY ITS OWN SERVER
S107
TO TRANSMIT DNS RESPONSE MESSAGE
END

FIG. 5

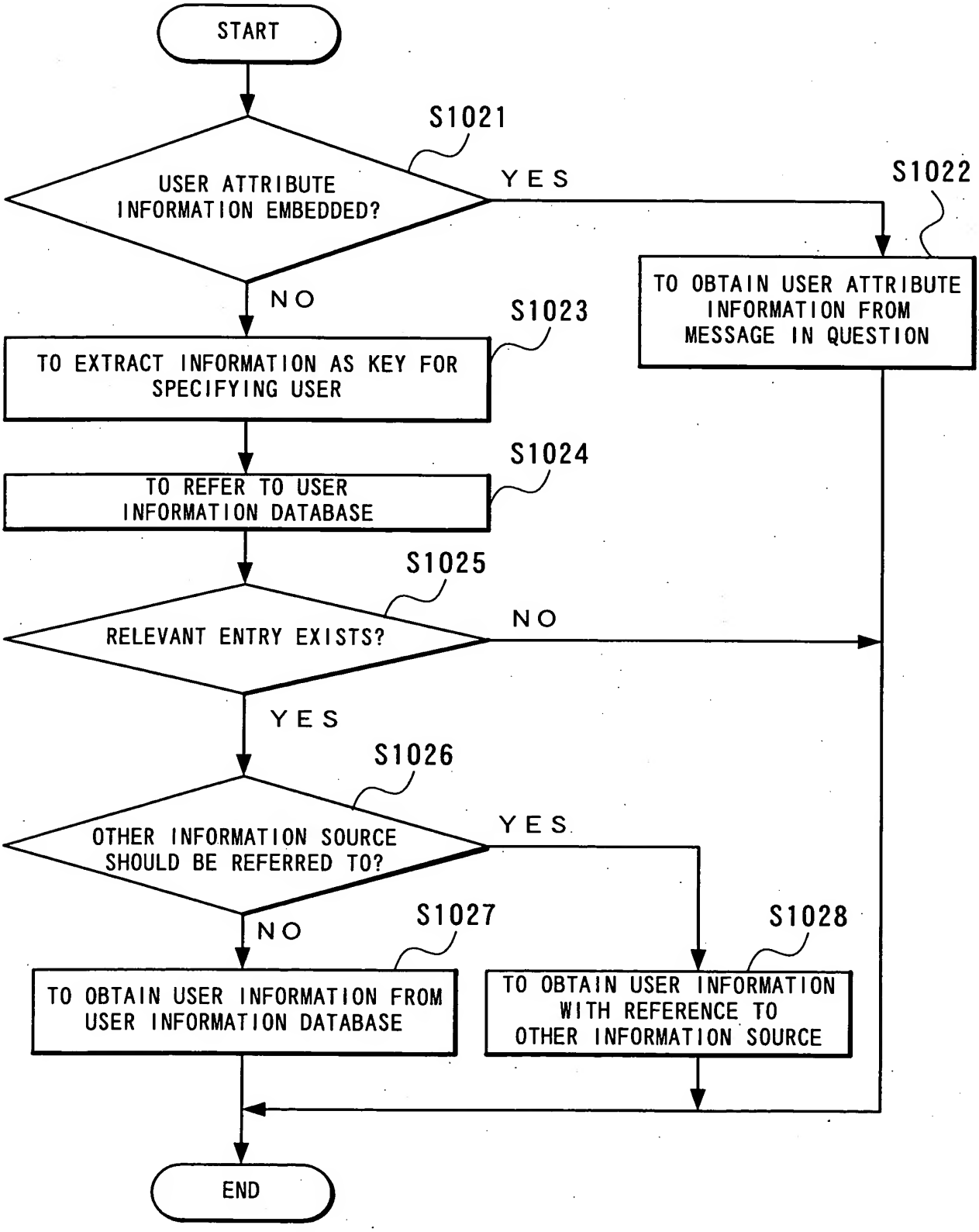

START
S1021
USER ATTRIBUTE INFORMATION EMBEDDED?
YES
S1022
TO OBTAIN USER ATTRIBUTE INFORMATION FROM MESSAGE IN QUESTION
NO
S1023
TO EXTRACT INFORMATION AS KEY FOR SPECIFYING USER
S1024
TO REFER TO USER INFORMATION DATABASE
S1025
RELEVANT ENTRY EXISTS?
NO
YES
S1026
OTHER INFORMATION SOURCE SHOULD BE REFERRED TO?
YES
NO
S1027
TO OBTAIN USER INFORMATION FROM USER INFORMATION DATABASE
S1028
TO OBTAIN USER INFORMATION WITH REFERENCE TO OTHER INFORMATION SOURCE
END

FIG. 6

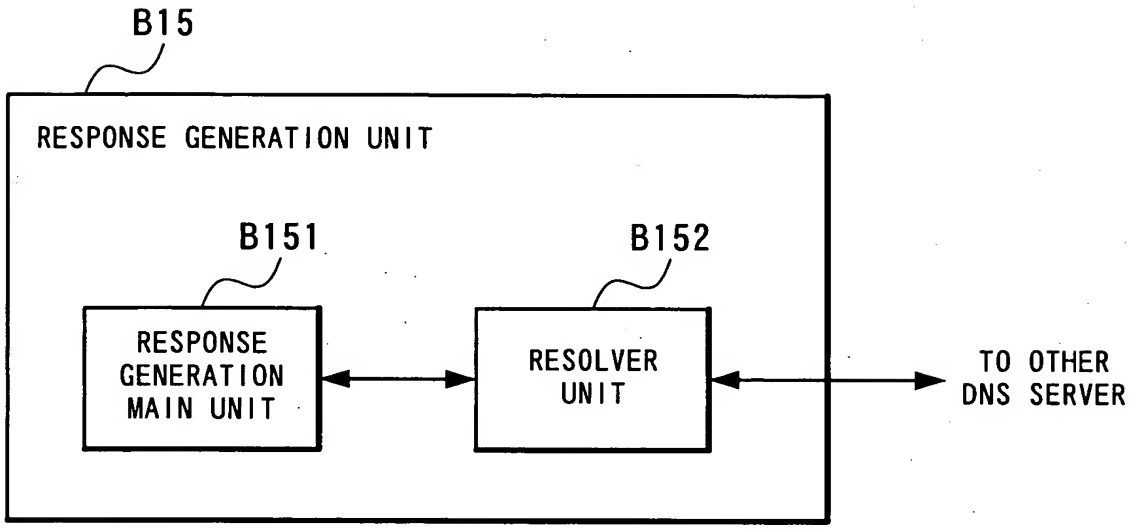

B15
RESPONSE GENERATION UNIT
B151
B152
RESPONSE GENERATION MAIN UNIT
RESOLVER UNIT
TO OTHER DNS SERVER

FIG. 7

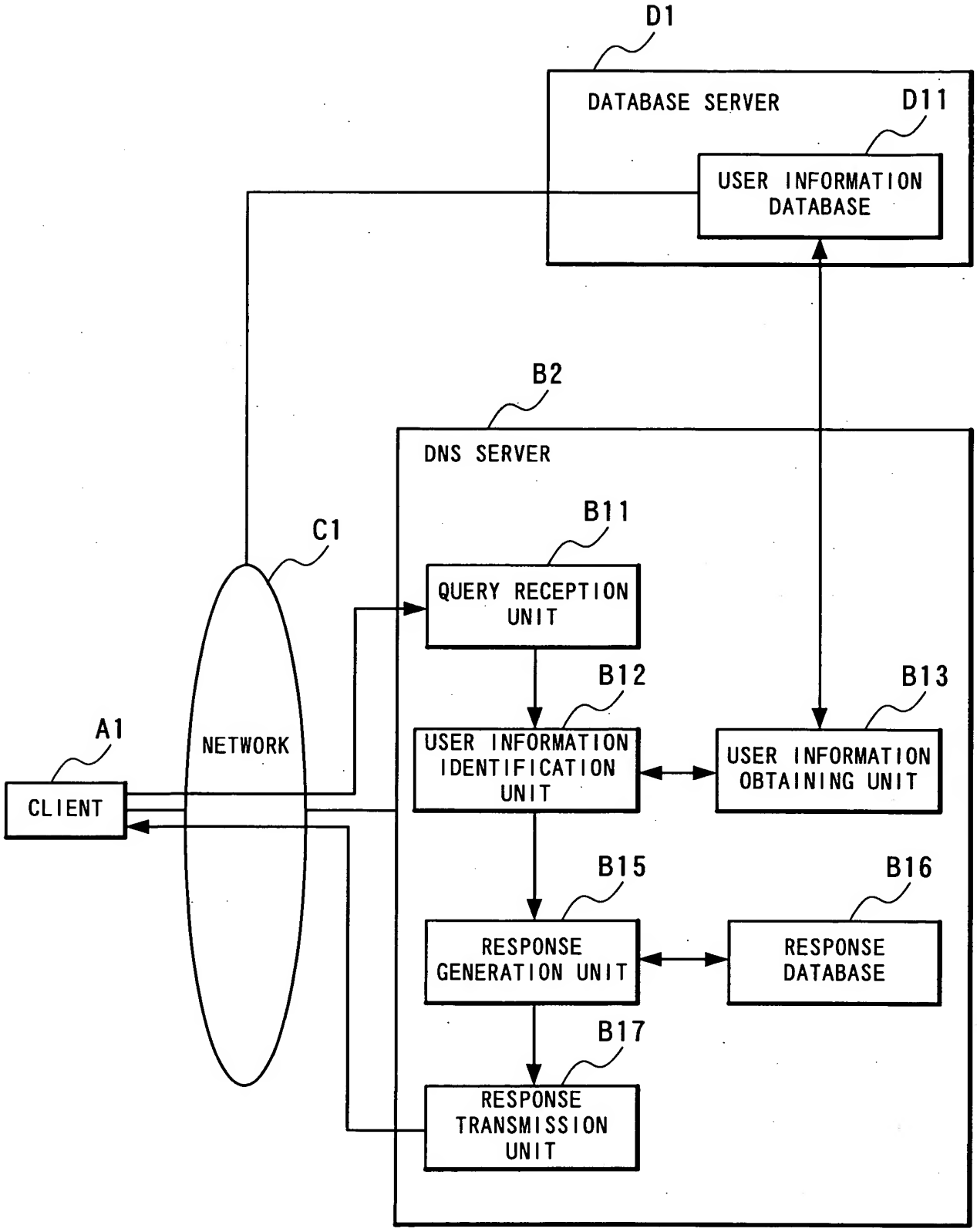

D1
DATABASE SERVER
D11
USER INFORMATION DATABASE
B2
DNS SERVER
B11
QUERY RECEPTION UNIT
B12
USER INFORMATION IDENTIFICATION UNIT
B13
USER INFORMATION OBTAINING UNIT
B15
RESPONSE GENERATION UNIT
B16
RESPONSE DATABASE
B17
RESPONSE TRANSMISSION UNIT
C1
NETWORK
A1
CLIENT

FIG. 8

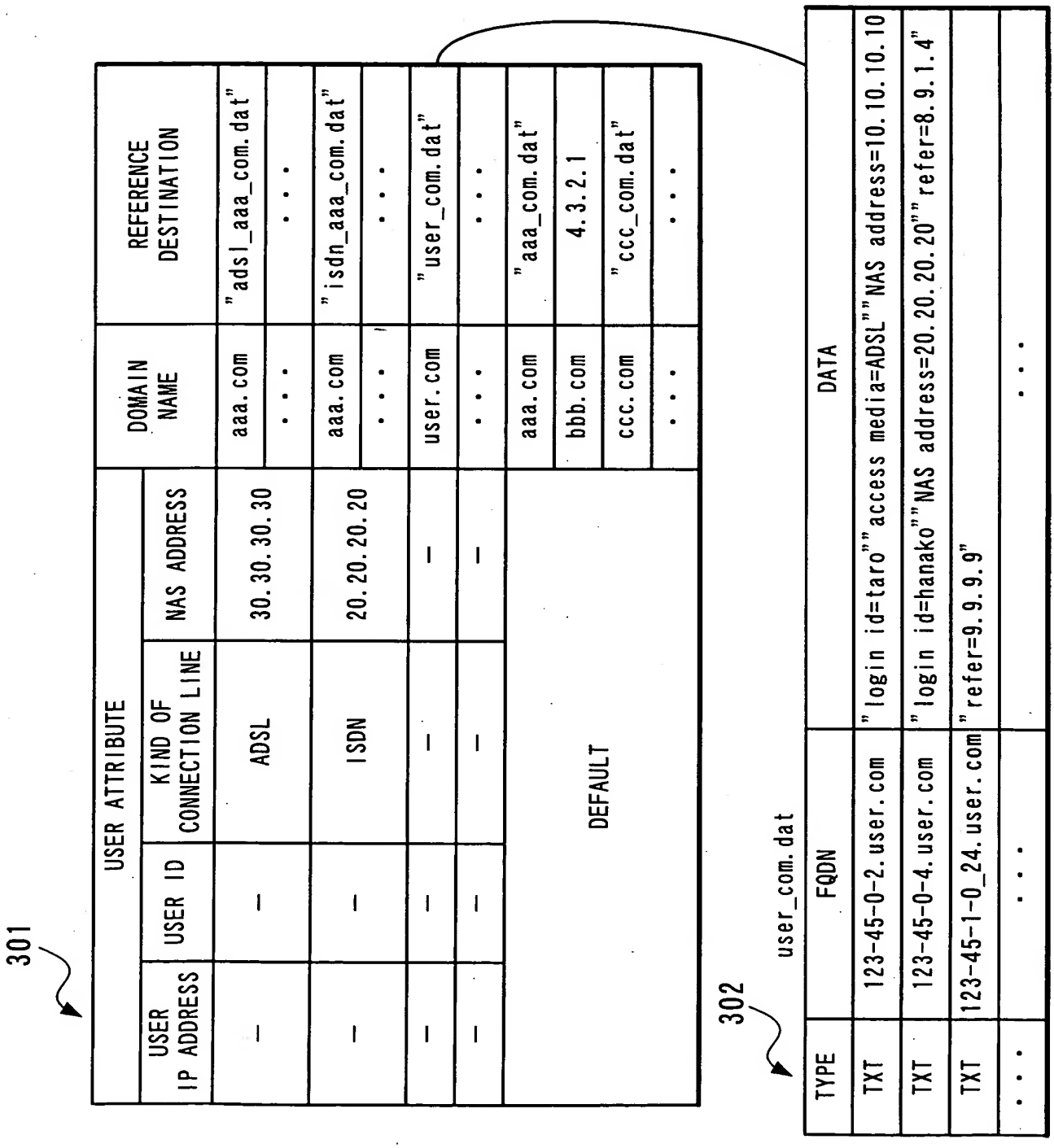

301
USER ATTRIBUTE
USER IP ADDRESS
USER ID
KIND OF CONNECTION LINE
NAS ADDRESS
DOMAIN NAME
REFERENCE DESTINATION
—
ADSL
30.30.30.30
aaa.com
"adsl_aaa_com.dat"
—
ISDN
20.20.20.20
aaa.com
"isdn_aaa_com.dat"
—
—
—
user.com
"user_com.dat"
DEFAULT
aaa.com
"aaa_com.dat"
bbb.com
4.3.2.1
ccc.com
"ccc_com.dat"
302
user_com.dat
TYPE
FQDN
DATA
TXT
123-45-0-2.user.com
"login id=taro""access media=ADSL""NAS address=10.10.10.10
TXT
123-45-0-4.user.com
"login id=hanako""NAS address=20.20.20.20""refer=8.9.1.4"
TXT
123-45-1-0_24.user.com
"refer=9.9.9.9"

FIG. 9

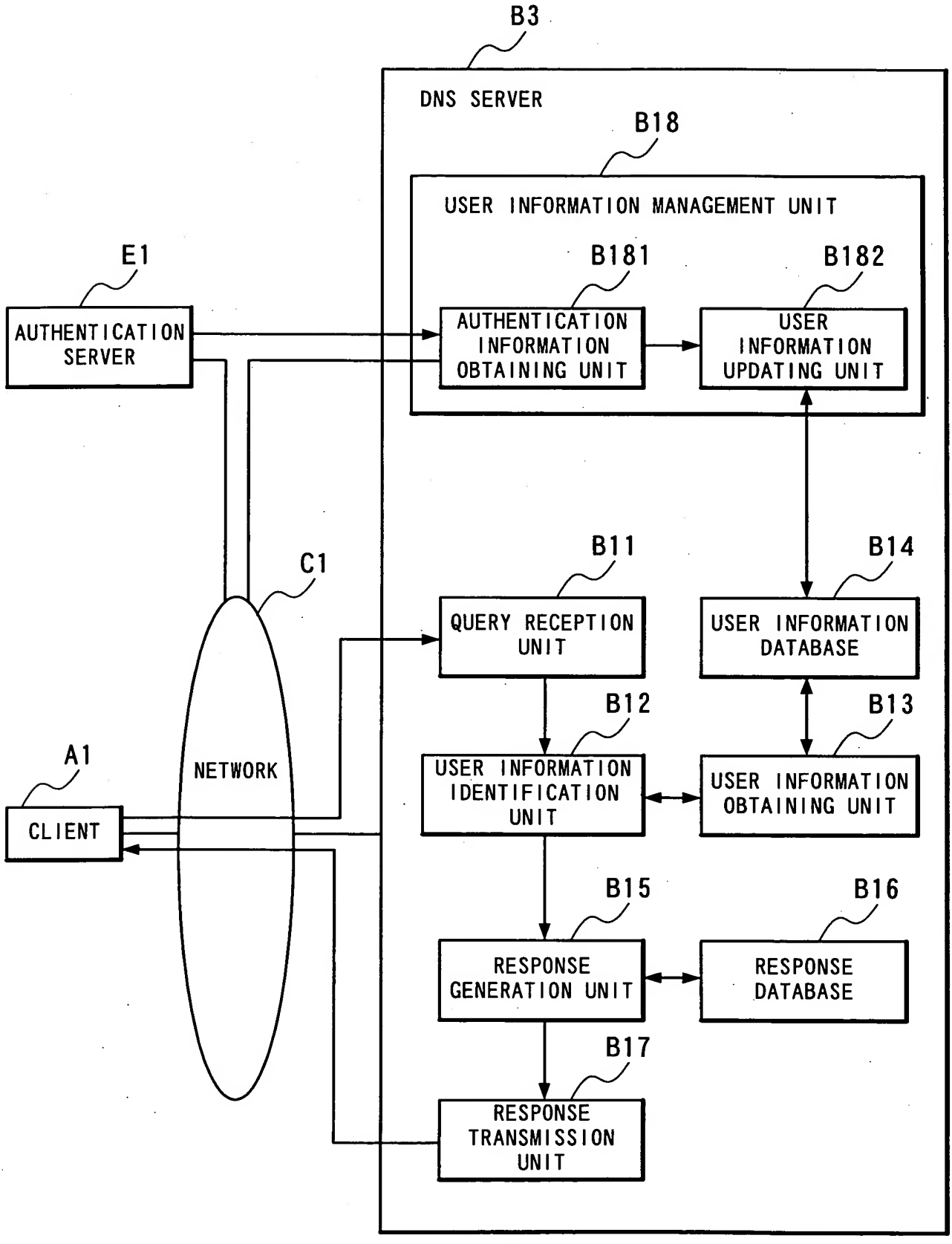

B3
DNS SERVER
B18
USER INFORMATION MANAGEMENT UNIT
E1
B181
B182
AUTHENTICATION SERVER
AUTHENTICATION INFORMATION OBTAINING UNIT
USER INFORMATION UPDATING UNIT
B11
B14
C1
QUERY RECEPTION UNIT
USER INFORMATION DATABASE
B12
B13
A1
NETWORK
CLIENT
USER INFORMATION IDENTIFICATION UNIT
USER INFORMATION OBTAINING UNIT
B15
B16
RESPONSE GENERATION UNIT
RESPONSE DATABASE
B17
RESPONSE TRANSMISSION UNIT

FIG.10

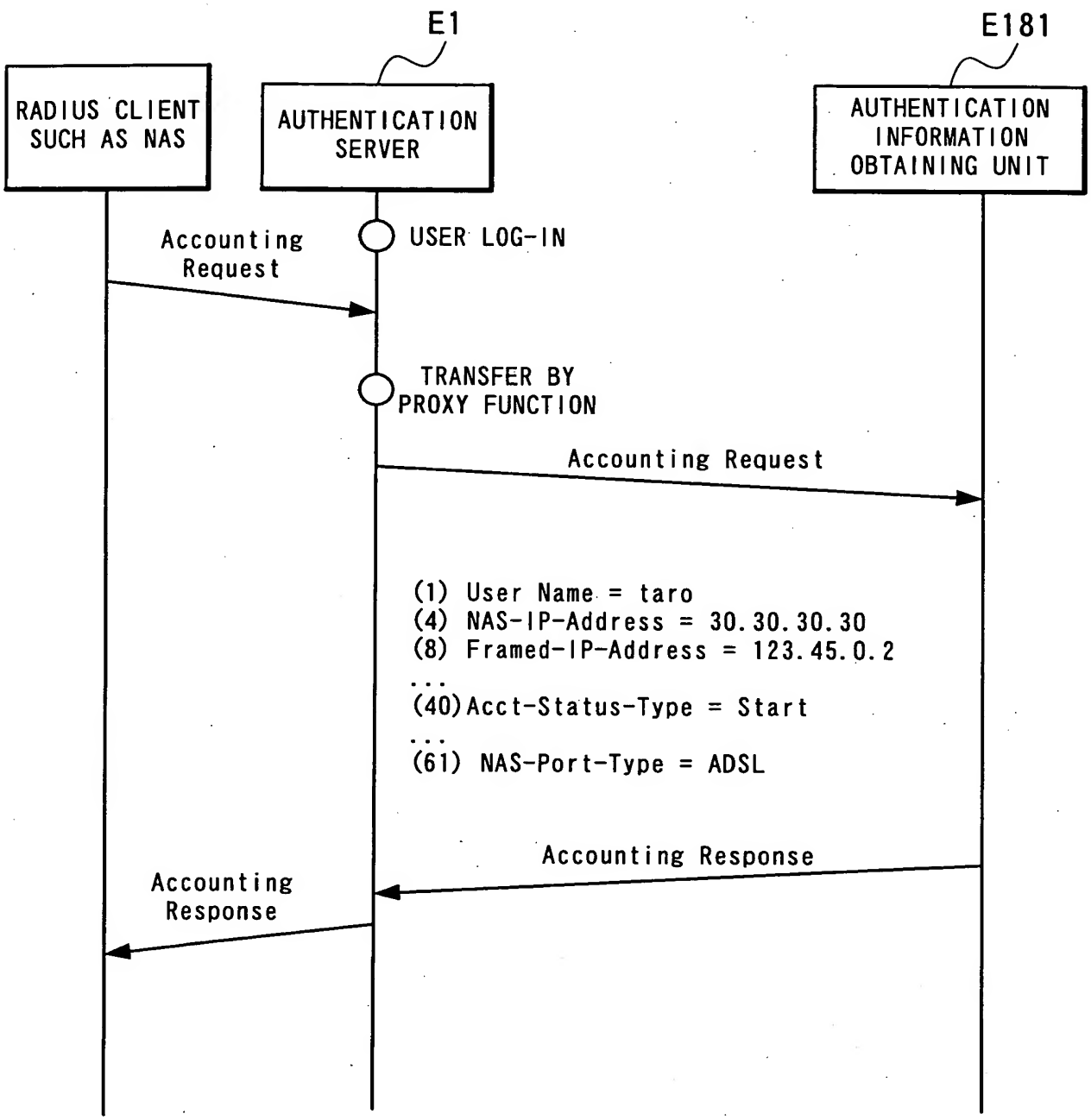

E1
E181
RADIUS CLIENT SUCH AS NAS
AUTHENTICATION SERVER
AUTHENTICATION INFORMATION OBTAINING UNIT
Accounting Request
USER LOG-IN
TRANSFER BY PROXY FUNCTION
Accounting Request
(1) User Name = taro
(4) NAS-IP-Address = 30.30.30.30
(8) Framed-IP-Address = 123.45.0.2
...
(40) Acct-Status-Type = Start
...
(61) NAS-Port-Type = ADSL
Accounting Response
Accounting Response

FIG. 11

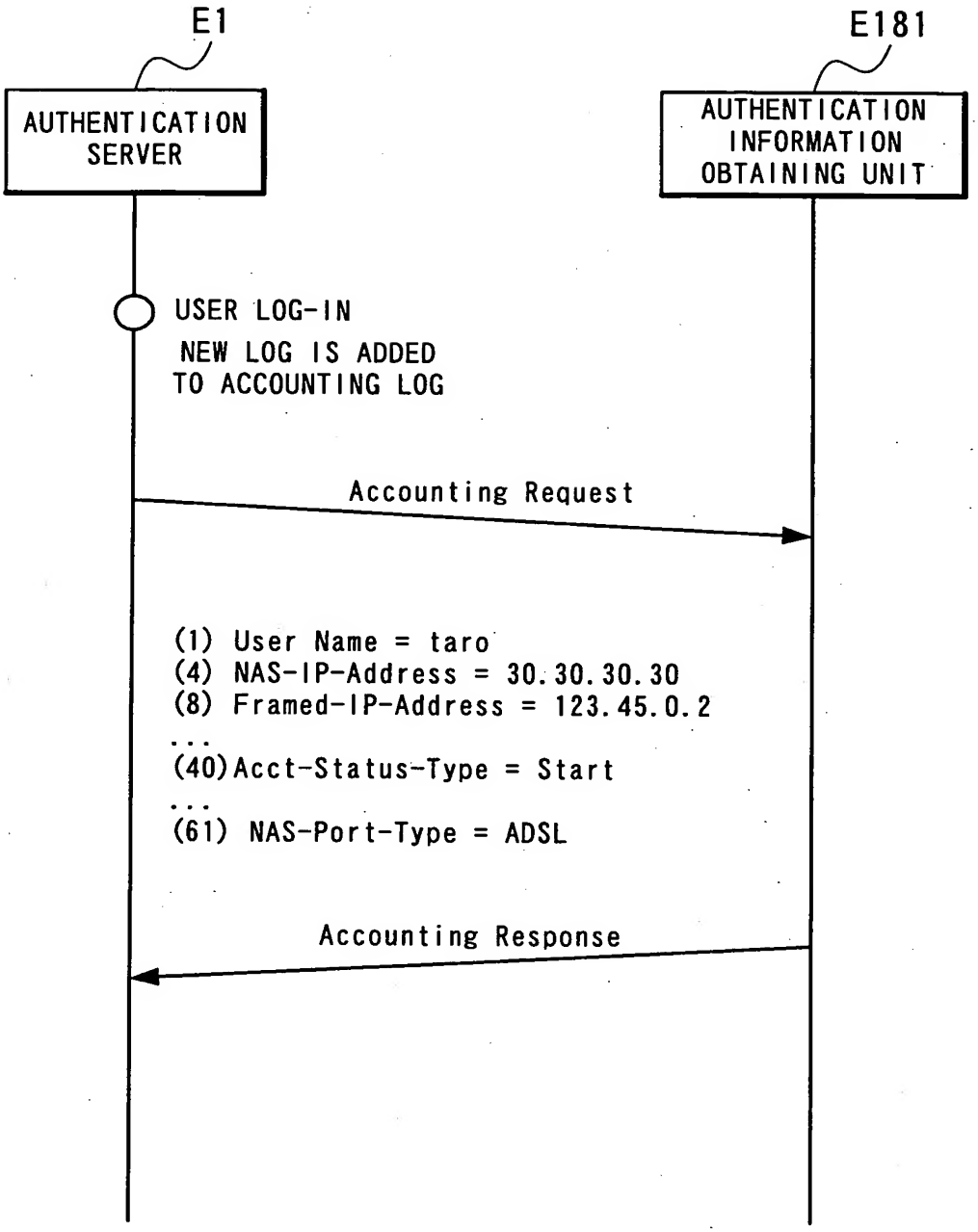
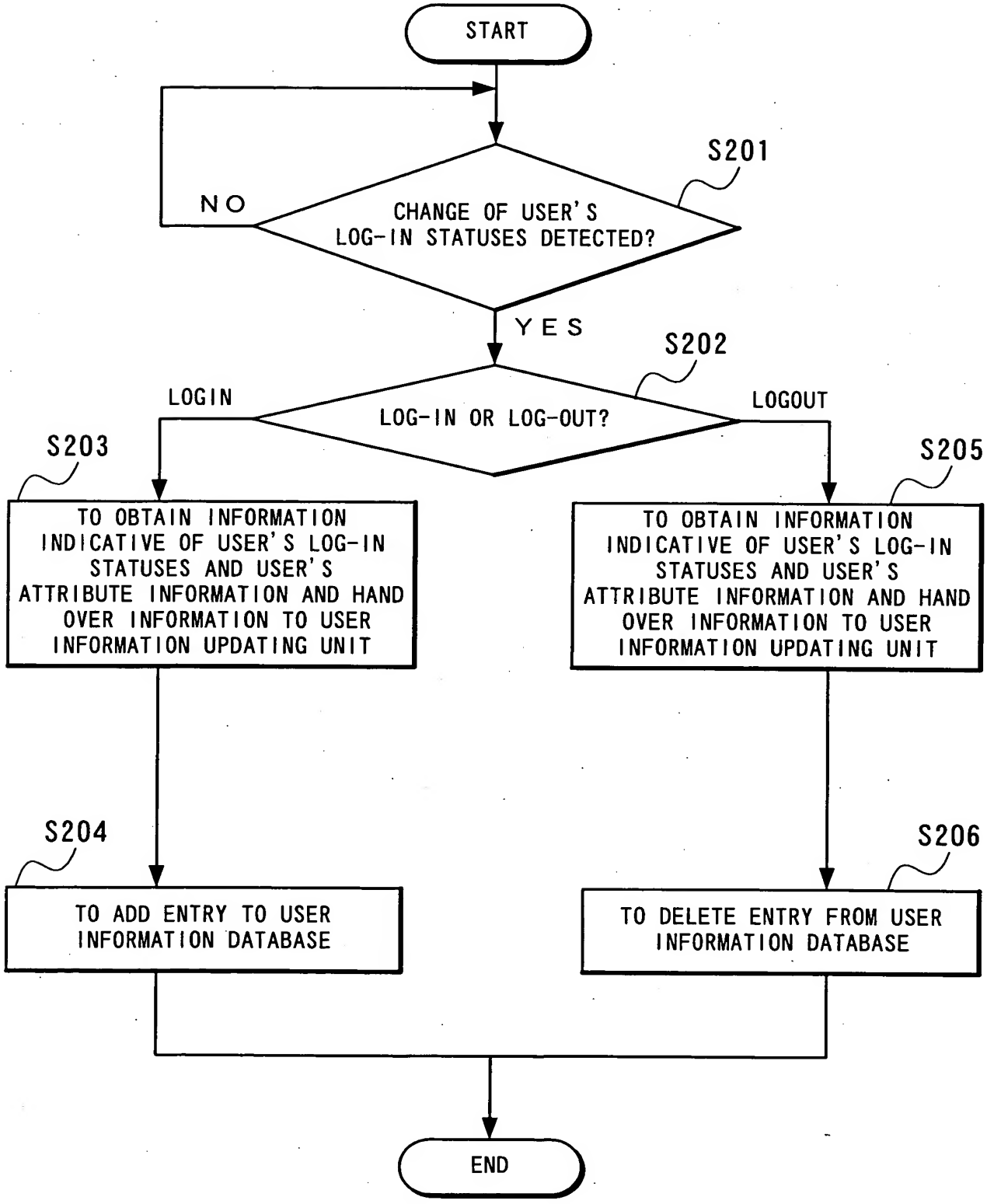

E1
E181
AUTHENTICATION SERVER
AUTHENTICATION INFORMATION OBTAINING UNIT
USER LOG-IN
NEW LOG IS ADDED TO ACCOUNTING LOG
Accounting Request
(1) User Name = taro
(4) NAS-IP-Address = 30.30.30.30
(8) Framed-IP-Address = 123.45.0.2
...
(40) Acct-Status-Type = Start
...
(61) NAS-Port-Type = ADSL
Accounting Response

FIG. 12


START
S201
NO
CHANGE OF USER'S LOG-IN STATUSES DETECTED?
YES
S202
LOGIN
LOG-IN OR LOG-OUT?
LOGOUT
S203
TO OBTAIN INFORMATION INDICATIVE OF USER'S LOG-IN STATUSES AND USER'S ATTRIBUTE INFORMATION AND HAND OVER INFORMATION TO USER INFORMATION UPDATING UNIT
S205
TO OBTAIN INFORMATION INDICATIVE OF USER'S LOG-IN STATUSES AND USER'S ATTRIBUTE INFORMATION AND HAND OVER INFORMATION TO USER INFORMATION UPDATING UNIT
S204
TO ADD ENTRY TO USER INFORMATION DATABASE
S206
TO DELETE ENTRY FROM USER INFORMATION DATABASE
END

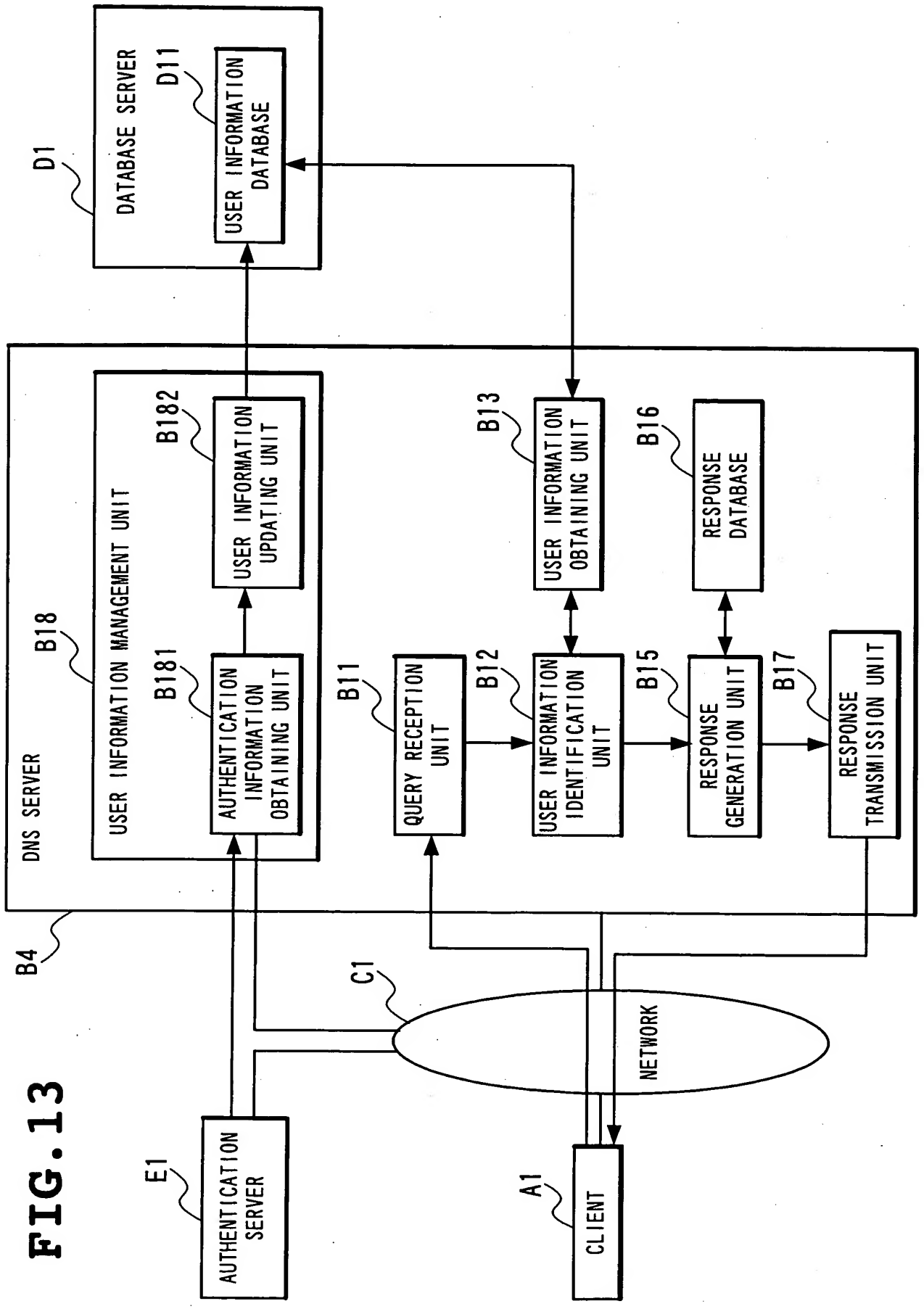

D1
DATABASE SERVER
D11
USER INFORMATION DATABASE
B4
DNS SERVER
B18
USER INFORMATION MANAGEMENT UNIT
B181
AUTHENTICATION INFORMATION OBTAINING UNIT
B182
USER INFORMATION UPDATING UNIT
B11
QUERY RECEPTION UNIT
B12
USER INFORMATION IDENTIFICATION UNIT
B13
USER INFORMATION OBTAINING UNIT
B15
RESPONSE GENERATION UNIT
B16
RESPONSE DATABASE
B17
RESPONSE TRANSMISSION UNIT
C1
NETWORK
E1
AUTHENTICATION SERVER
A1
CLIENT

FIG. 13

FIG. 14

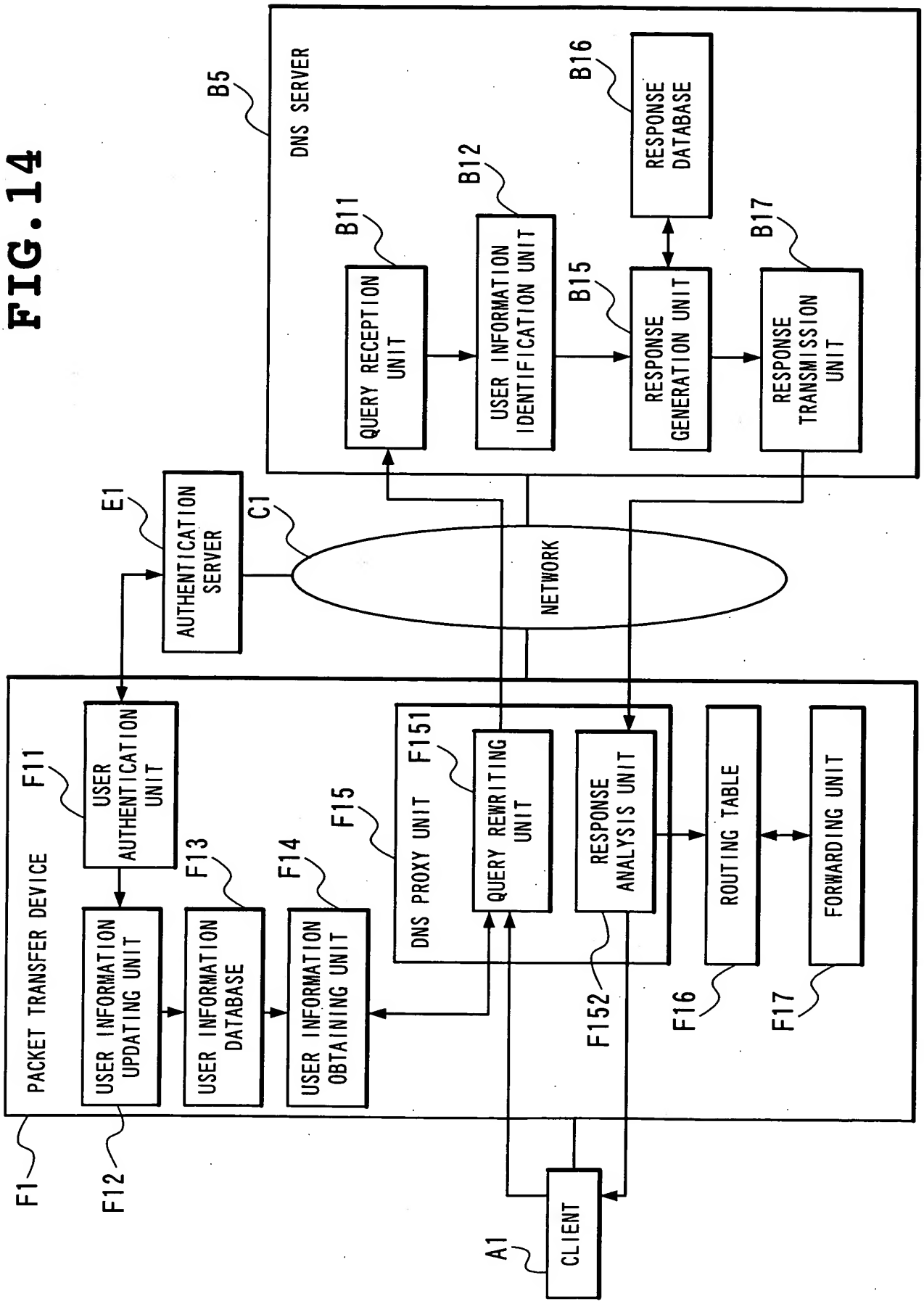

B5
DNS SERVER
B16
RESPONSE DATABASE
B12
B11
B17
QUERY RECEPTION UNIT
USER INFORMATION IDENTIFICATION UNIT
B15
RESPONSE GENERATION UNIT
RESPONSE TRANSMISSION UNIT
E1
AUTHENTICATION SERVER
C1
NETWORK
PACKET TRANSFER DEVICE
F11
USER AUTHENTICATION UNIT
F13
F14
F15
F151
DNS PROXY UNIT
QUERY REWRITING UNIT
RESPONSE ANALYSIS UNIT
ROUTING TABLE
FORWARDING UNIT
USER INFORMATION UPDATING UNIT
USER INFORMATION DATABASE
USER INFORMATION OBTAINING UNIT
F1
F12
F152
F16
F17
A1
CLIENT

FIG. 15

401

USER ATTRIBUTE				DOMAIN NAME	REFERENCE DESTINATION
USER ID	KIND OF CONNECTION LINE	GROUP ID	PACKET TRANSFER DEVICE ID		
—	ethernet	silver	switch99	ddd.com	"sw99_ddd_com.dat"
				• • •	• • •
—	wireless LAN	—	—	ddd.com	"wlan_ddd_com.dat"
				• • •	• • •
hanako	—	—	switch99	ddd.com	"hanako_ddd_com.dat"
				• • •	• • •
—	—	—	—	• • •	• • •
DEFAULT				aaa.com	"aaa_com.dat"
				bbb.com	4.3.2.1
				ccc.com	"ccc_com.dat"
				• • •	• • •

402

sw99_ddd_com.dat

TYPE	FQDN	DATA	ADDITIONAL DATA
A	www.ddd.com	20.1.1.1	SrcPAddr=40.1.1.1, vlanID=111, outport=21, priority=0
A	ftp.ddd.com	30.1.1.1	SrcPAddr=40.1.1.1, DestIPAddr=50.1.1.1, vlanID=222, outport=21, priority=0
A	host.ddd.com	40.1.1.1	—
• • •	• • •	• • •	• • •

403

hanako_ddd_com.dat

TYPE	FQDN	DATA	ADDITIONAL DATA
A	www.ddd.com	60.1.1.1	SrcPAddr=40.1.1.1, DestIPAddr=90.1.1.1, vlanID=333, outport=31, priority=1
A	ftp.ddd.com	70.1.1.1	SrcPAddr=50.1.1.1, DestIPAddr=90.1.1.1, vlanID=333, outport=32, priority=1
A	host.ddd.com	80.1.1.1	—
• • •	• • •	• • •	• • •

FIG.16

F13

INPUT PORT	SOURCE MAC ADDRESS	USER ID	KIND OF CONNECTION LINE	CONNECTION LINE SPEED	GROUP ID	. . .
02	00:12:34:56:78:9a	taro	ethernet	100Mbps	silver	. . .
11	00:bc:de:f0:12:34	hanako	ethernet	10Mbps	—	. . .
12	00:56:78:9a:bc:de	pochi	wireless LAN	10Mbps	silver	. . .
. . .	. . .	. . .	. . .	. . .	. . .	. . .

FIG.17

F16

INPUT PACKET INFORMATION				TRANSFER METHOD				
INPUT PORT	SOURCE MAC ADDRESS	DESTINATION IP ADDRESS	vlan-ID	SOURCE IP ADDRESS	DESTINATION IP ADDRESS	vlan-ID	OUTPUT PORT	PRIORITY
02	00:12:34:56:78:9a	20.1.1.1	100	40.1.1.1	—	111	21	ORDINARY
11	00:bc:de:f0:12:34	60.1.1.1	200	40.1.1.1	90.1.1.1	333	31	HIGH PRIORITY
12	00:56:78:9a:bc:de	40.1.1.1	—	—	—	222	33	ORDINARY
...	...	...	...	...	...	...	...	...

Title: NAME RESOLUTION SERVER AND PACKET TRANSFER DEVICE
Inventor(s): Norihito FUJITA, et al.
DOCKET NO.: 040405-0367

FIG.18

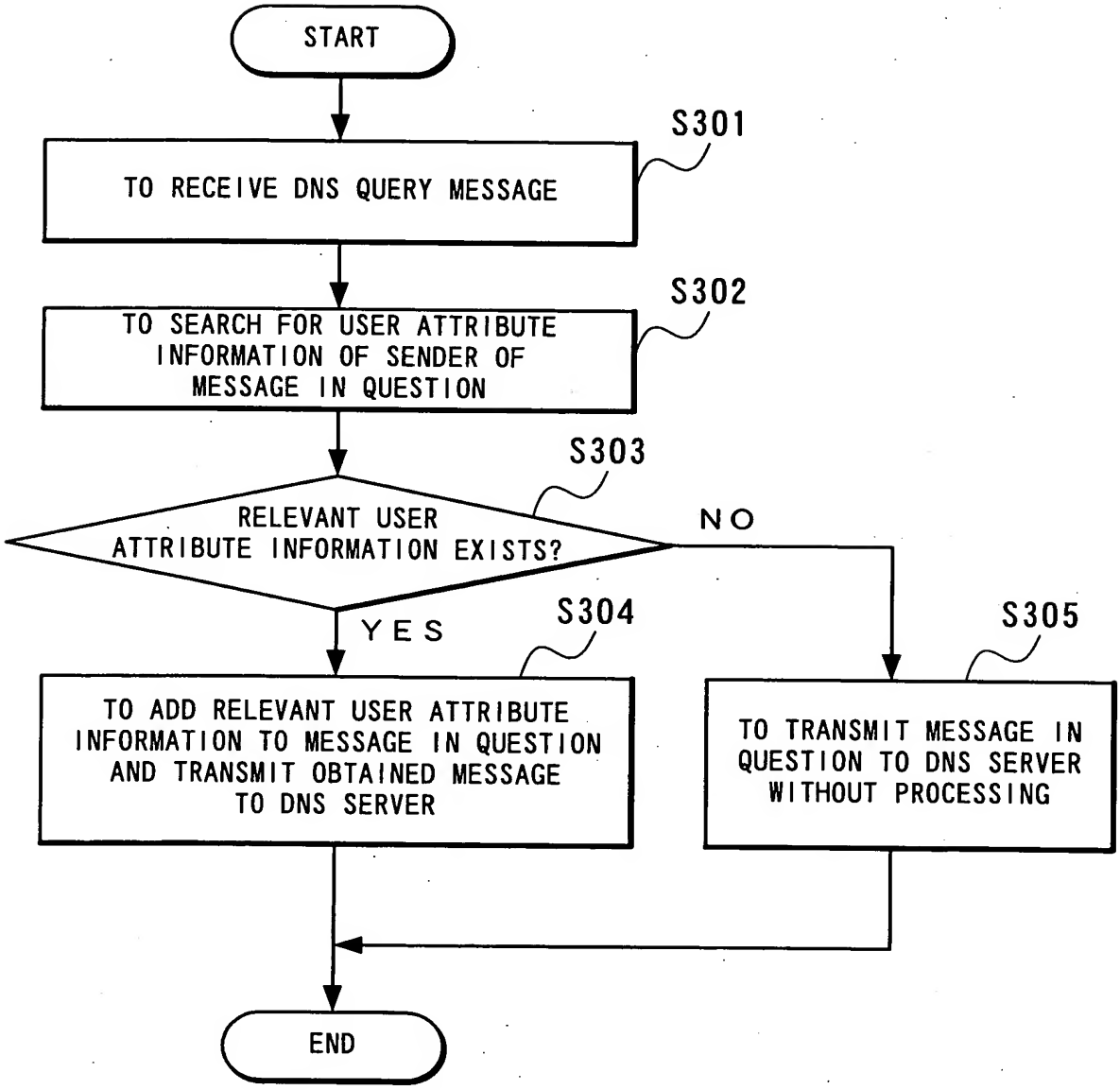

START
S301
TO RECEIVE DNS QUERY MESSAGE
S302
TO SEARCH FOR USER ATTRIBUTE INFORMATION OF SENDER OF MESSAGE IN QUESTION
S303
RELEVANT USER ATTRIBUTE INFORMATION EXISTS?
NO
YES
S304
TO ADD RELEVANT USER ATTRIBUTE INFORMATION TO MESSAGE IN QUESTION AND TRANSMIT OBTAINED MESSAGE TO DNS SERVER
S305
TO TRANSMIT MESSAGE IN QUESTION TO DNS SERVER WITHOUT PROCESSING
END

FIG. 19

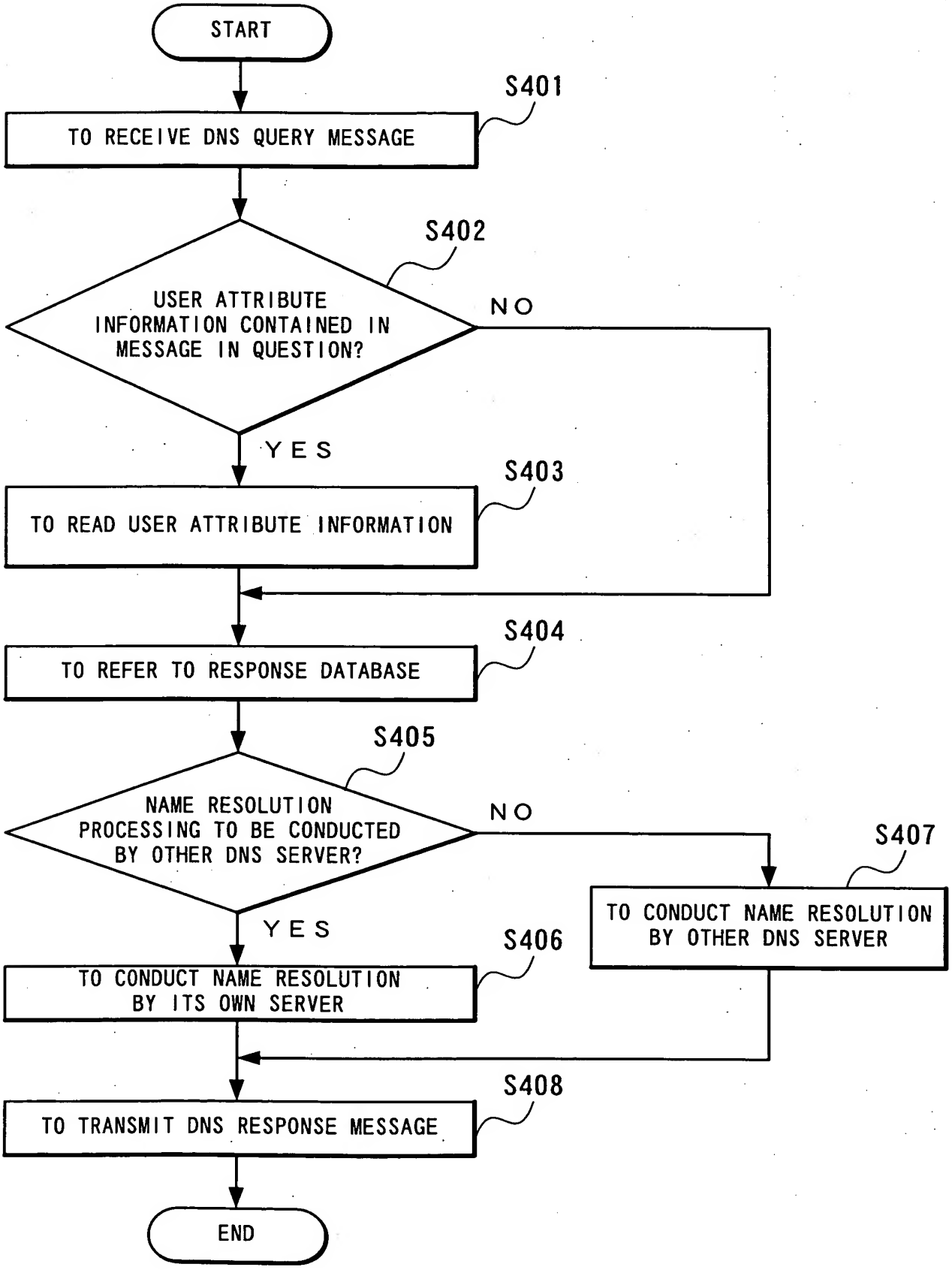
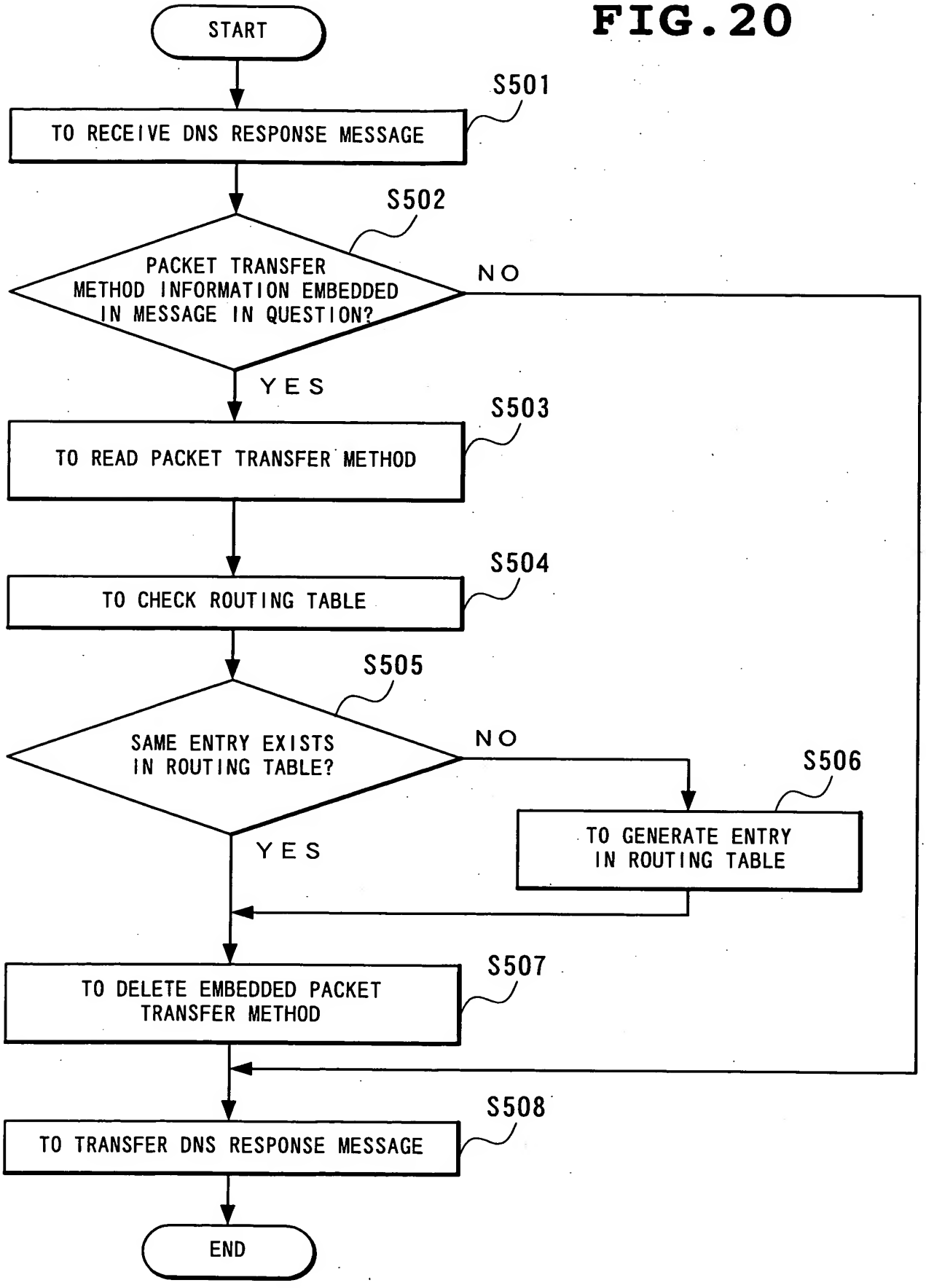
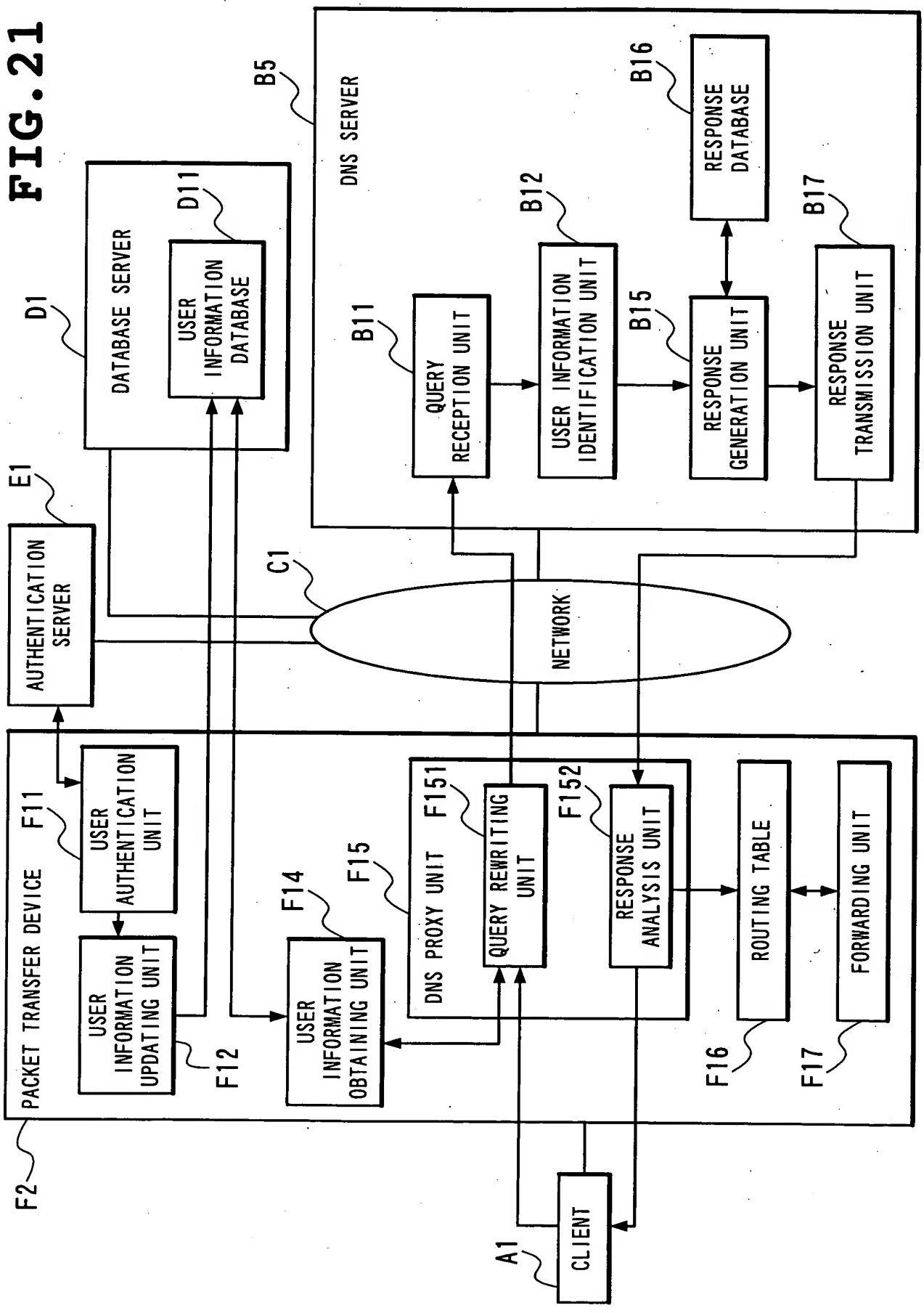

START
S401
TO RECEIVE DNS QUERY MESSAGE
S402
USER ATTRIBUTE INFORMATION CONTAINED IN MESSAGE IN QUESTION?
NO
YES
S403
TO READ USER ATTRIBUTE INFORMATION
S404
TO REFER TO RESPONSE DATABASE
S405
NAME RESOLUTION PROCESSING TO BE CONDUCTED BY OTHER DNS SERVER?
NO
S407
TO CONDUCT NAME RESOLUTION BY OTHER DNS SERVER
YES
S406
TO CONDUCT NAME RESOLUTION BY ITS OWN SERVER
S408
TO TRANSMIT DNS RESPONSE MESSAGE
END

FIG.20


START
S501
TO RECEIVE DNS RESPONSE MESSAGE
S502
PACKET TRANSFER METHOD INFORMATION EMBEDDED IN MESSAGE IN QUESTION?
NO
YES
S503
TO READ PACKET TRANSFER METHOD
S504
TO CHECK ROUTING TABLE
S505
SAME ENTRY EXISTS IN ROUTING TABLE?
NO
S506
TO GENERATE ENTRY IN ROUTING TABLE
YES
S507
TO DELETE EMBEDDED PACKET TRANSFER METHOD
S508
TO TRANSFER DNS RESPONSE MESSAGE
END

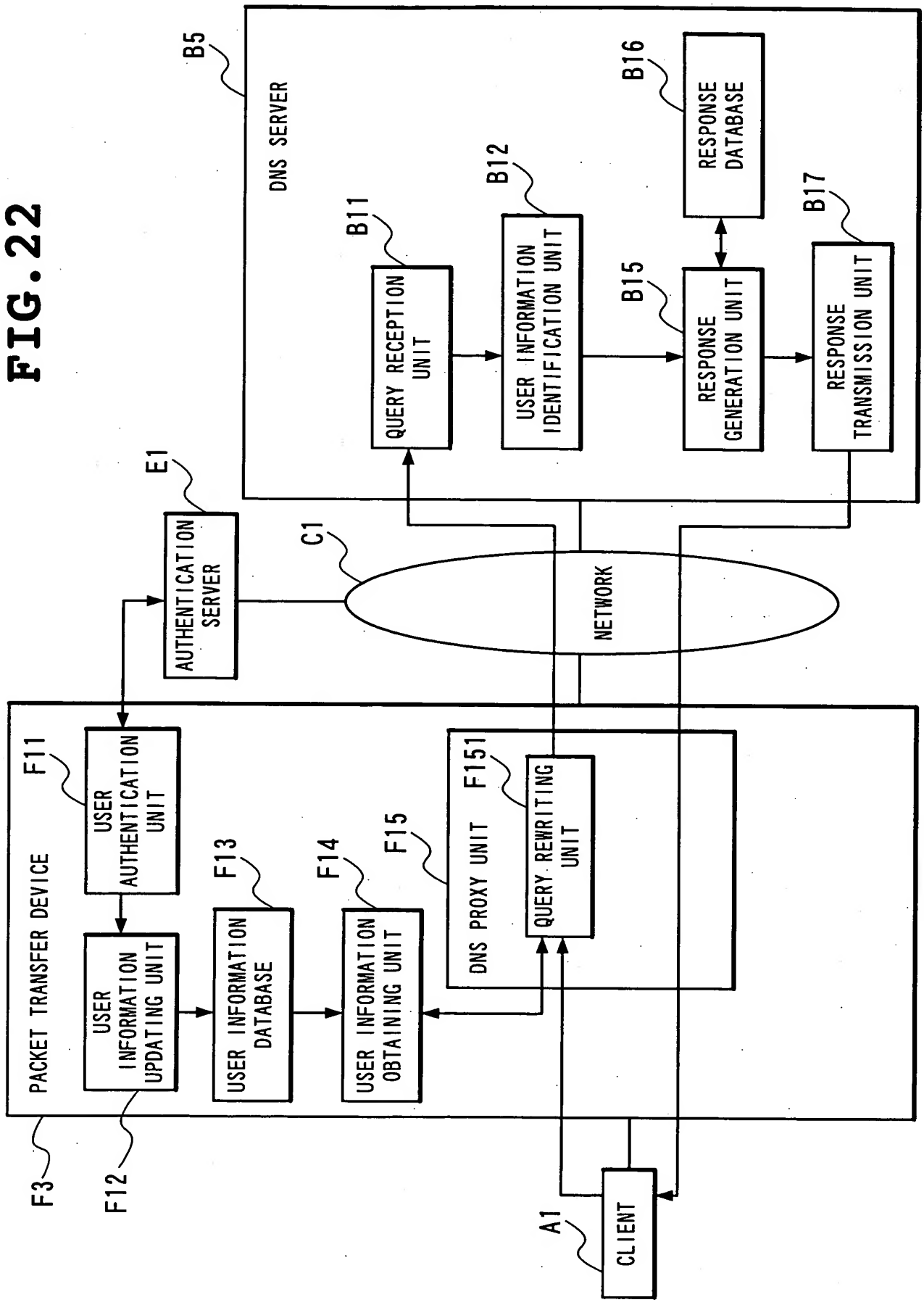
Title: NAME RESOLUTION SERVER AND PACKET TRANSFER DEVICE
Inventor(s): Norihito FUJITA, et al.
DOCKET NO.: 040405-0367

FIG.21



Title: NAME RESOLUTION SERVER AND PACKET TRANSFER DEVICE
Inventor(s): Norihito FUJITA, et al.
DOCKET NO.: 040405-0367

FIG.22



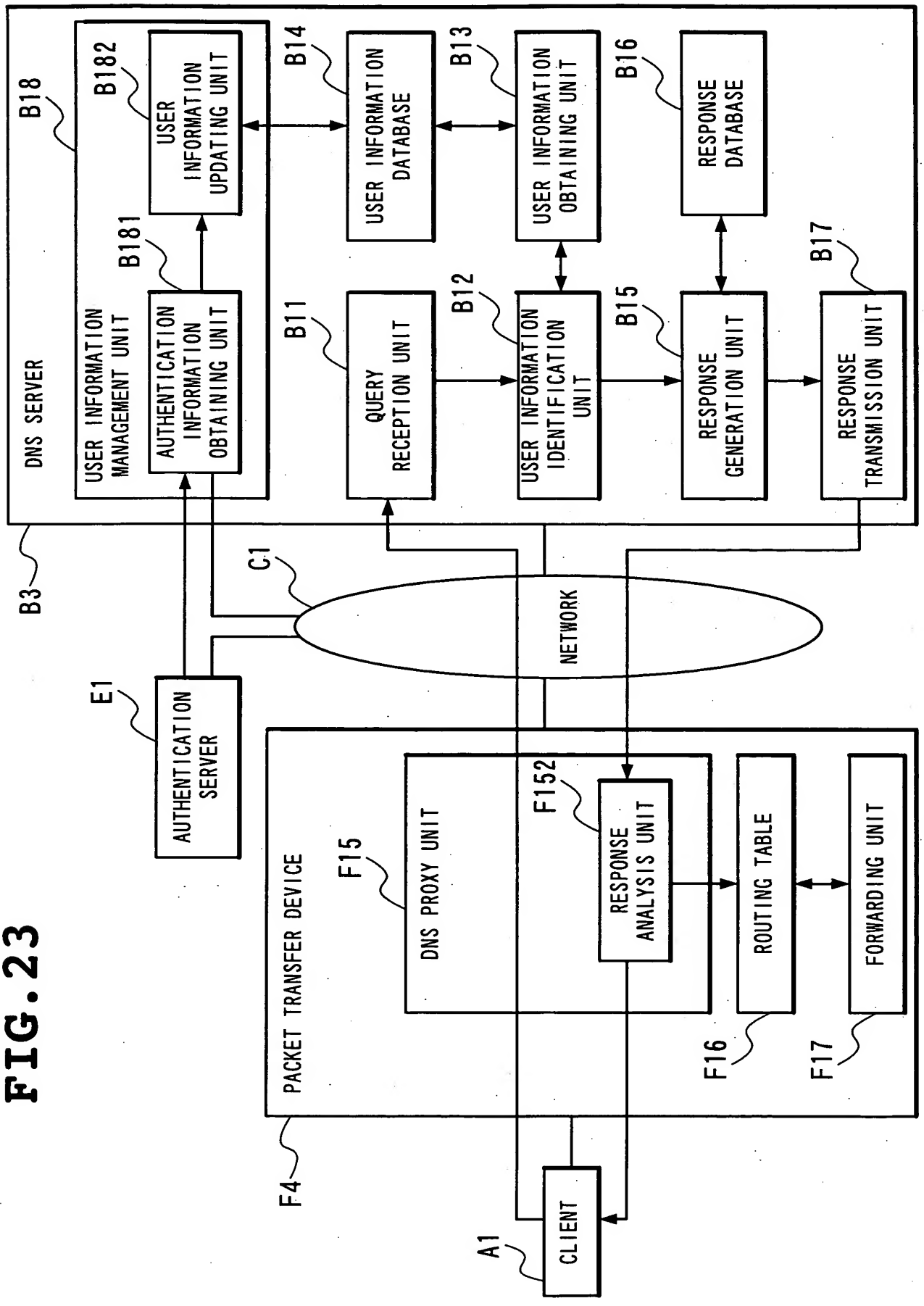

DNS SERVER
B18
USER INFORMATION MANAGEMENT UNIT
B182
USER INFORMATION UPDATING UNIT
B181
AUTHENTICATION INFORMATION OBTAINING UNIT
B14
USER INFORMATION DATABASE
B13
USER INFORMATION OBTAINING UNIT
B16
RESPONSE DATABASE
B11
QUERY RECEPTION UNIT
B12
USER INFORMATION IDENTIFICATION UNIT
B15
RESPONSE GENERATION UNIT
B17
RESPONSE TRANSMISSION UNIT
B3
C1
NETWORK
E1
AUTHENTICATION SERVER
PACKET TRANSFER DEVICE
F15
DNS PROXY UNIT
F152
RESPONSE ANALYSIS UNIT
ROUTING TABLE
FORWARDING UNIT
F16
F17
F4
A1
CLIENT

FIG.23